

CHAPTER 1

COMPUTER OVERVIEW

WHAT IS A COMPUTER?

- Def: A computer is an electronic device that can perform a variety of operations in accordance with set of instructions called program.

DATA

- Data. Data in a computer terminology mean raw facts and figures.
- For ex-mohan,1977 etc.

INFORMATION

- INFORMATION. It means what we get after processing

Data(meaningful data);Data are aggregated and summarized in various meaningful ways to form information.for ex. mohan's roll no is 1977.

DATA VS. INFORMATION

you should understand that what goes in the computers is data and what comes out of them is information. This process of turning data into information is also known as information processing cycle.

FUNCTIONING OF A COMPUTER

- The first step is of taking inputs i.e. data on which the actual processing will take place.
- The second step is that of processing. It is called as “processing stage”.
- The 3rd and the last stage is that of result stage. This is what we call as “output stage”.

IPO CYCLE

- Certain input is needed to accomplish a task, a process is carried out on the input to produce an output.
- Every task including that of computer goes through this cycle.

FUNCTIONAL COMPONENTS OF A COMPUTER

INPUT UNIT

CPU

OUTPUT UNIT

MEMORY

INPUT UNIT

- **An input unit takes the input and converts it into binary form so that it can be understood by the computer. ex. Keyboard, mouse etc.**

CENTRAL PROCESSING UNIT (CPU)

The CPU is the control centre (brain) for a computer. Two of its main components are:

1. Arithmetic Logic Unit (ALU)
2. Control Unit (CU)

ALU

- **Arithmetic Logic Unit (ALU)**
- The ALU performs all the four arithmetical(+, -, *, /) and some logical(<, >, =, <=, >=, < >)operations.

CONTROL UNIT (CU)

- --.Control Unit (CU)
- The CU controls and guides the interpretation of all data and information.

THE OUTPUT UNIT

✓The output unit is formed by the output devices attached to computer.

Ex:--visual display unit, printer , plotter.

MEMORY

A memory cell may be defined as a device which can store symbol from a set of symbol.

If the computer has got it's brain as CPU it has also got memory which is most unlike human memory. It's memory is highly volatile (it forgets as quickly as possible.)It needs continuous supply of electricity.

MEMORY

Note:--the memory of computer is often called main memory or primary memory.

It is generally the third component of CPU

BITS & BYTES

Each of these memory cells is further broken down into smaller parts known as bits. A bit means a binary digit i.e. either 0 or 1. A number of bits together are used to store data instructions by their combinations.

- A bit is an elementary unit of memory.
- A group of 8 bits is called a byte and a group of 4 bits is called a nibble.
- One byte is the smallest unit which can represent a data item or a character.

HARDWARE AND SOFTWARE

A computer system also consists of hardware and software for its proper functioning.

HARDWARE

- Hardware represents the physical and tangible components of the computer i.e. the parts which we can touch and see.
- Ex:--Hard disk, motherboard, keyboard etc.
- Collectively, the electronic, electrical and mechanical equipment that makes up a computer is called Hardware.

THE PERIPHERALS

- The peripherals are the devices that surround the system unit e.g. the keyboard mouse speakers, printers, monitors etc. are peripherals.

PRIMARY HARDWARE COMPONENTS

- A computer consists of five primary components:-
- Input devices
- Storage devices
- Output devices
- CPU
- Memory

SOFTWARE

- Software represents the set of programs that governs the operation of a computer system and make the hardware run. Software can be classified broadly into three categories:--
 - Operating System
 - Language processors
(Operating System & Language processors are collectively called as system software.)
 - Application software

OPERATING SYSTEM

- An OPERATING SYSTEM is a program which acts as an interface between a user and the hardware (i.e. all the computer resources).
- OS controls is a major component of a system and controls all other components. (listed next.)

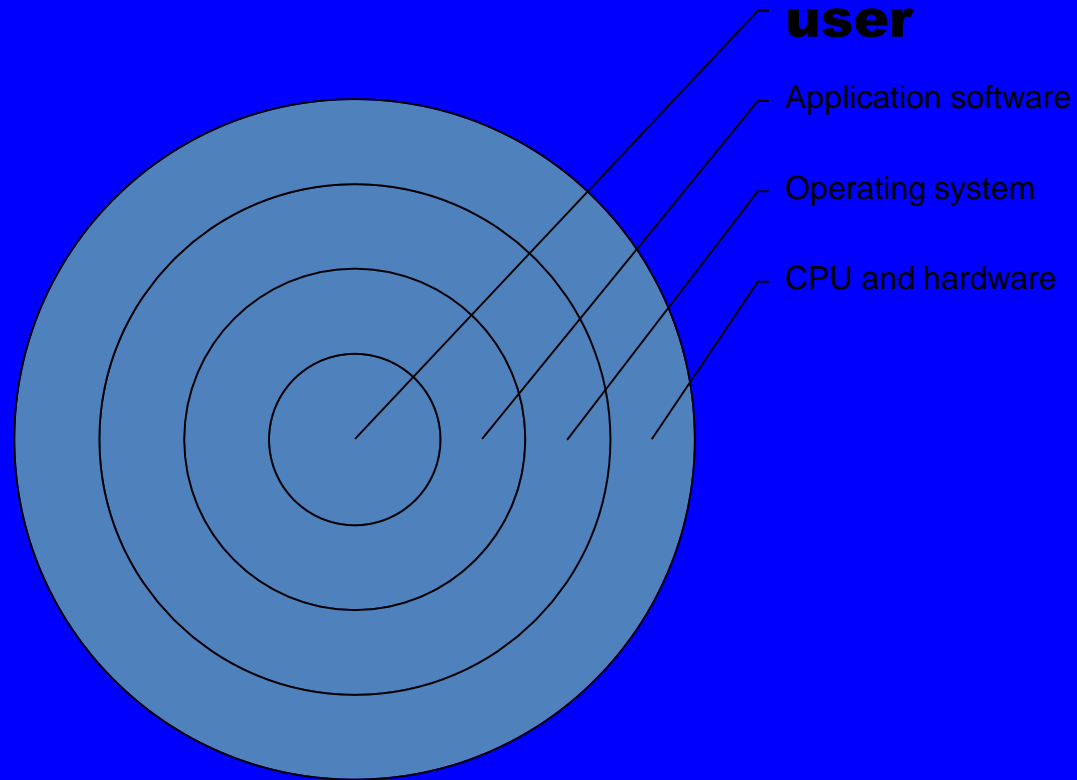
FUNCTIONS OF OS

- ✓ Mouse, printer and other hardware as well as with other software.
- ✓ Manages the way information is stored on retrieved from disks.

COMPONENTS OF A COMPUTER

- A computer consists of five primary components:
- Input devices
- Output devices
- CPU(Central Processing Unit)
- Memory
- Storage devices

OS(INTERFACE MANAGER)



TYPES OF OS

- There are many types of OS:-
- Single user
- Multi user
- Batch processing OS
- Multiprogramming OS etc.

LANGUAGE PROCESSORS

- The system programs that perform the job of converting codes in computer understandable language are known as language processors.
- The language processors are given below:-
- **Assembler** . The language processor converts the program written in assembly language to machine language.
- **Interpreter**. This language processor converts a HLL program into machine language by converting and executing it line by line.

COMPILER

- Compiler. it also converts a HLL program into machine language but a manner which is way different from a n assembler. It converts the entire program in one go, and reports the errors of the program along with line numbers.
- A combination of compiler and assembler is best up to the requirement.

APPLICATION SOFTWARE

- An application software is the set of programs necessary to carry out operations for a specified application.

TYPES OF APPLICATION SOFTWARES

- Application software can further be subdivided into two categories:-
 1. Customised application software. The type of application which is tailor made software according to a user's requirement.
 2. General application software. The type of software developed keeping in mind the general requirements for carrying out a specific task. Many users can use it simultaneously as it fulfils the general requirements.

WEAKNESSES OF A COMPUTER

- What has made the inevitable shift from manual style of working to computerized working possible?
- There must be some advantages of computer over the previous. The strength of computers :-
 - ✓ **Speed.** Computers, much faster than human beings, can execute millions of instructions in one second and thus can perform a task in minute/s which if performed manually would eat days together.

ADVANTAGES

- ✓ High storage capacity. Computers can store a large amount of information in a very small space.
- ✓ Accuracy. Computers can perform all the calculations and comparisons accurately provided the hardware doesn't malfunction.

ADVANTAGES

- ✓ Reliability. Computers are immune to tiredness and boredom or fatigue. Thus they are more reliable than human beings.
- ✓ Versatility. Computers can perform repetitive jobs efficiently. Along with it they can handle various tasks. They can work in areas where human mind can err. They can work with various types of data for ex—graphic, audio, visual, characters etc.

WHAT IT LACKS

- But the advantages counted limitations remain because limitations must follow advantages.
- Here limitations are:--
 - ✓ **LACK OF DECISION MAKING POWER.** Computers cannot decide on their own. They lack the power which is a great asset to us and everybody who is a human.
 - ✓ **IQ ZERO.** Computers are dumb machines with zero IQ. They need to be told

FIRMWARE & LIVEWARE

- Firmware is a pre-written program that is permanently stored in read-only memory. It configures the computer and is not so easily modifiable by the user. BIOS (Basic Input and Output services) instructions are an example of firmware.
- It is the term generally used for the people associated with and benefited from the computer system.

EVOLUTION OF COMPUTERS

- Ancient people used stones for counting or made scratches on wall or tied knots in a rope to record information. But all these were manual computing techniques. Attempts had been going on for developing faster computing devices and the first achievement was abacus, the pioneer computing device used by man.

ABACUS

- Around 3000 B.C, the Mesopotamians quite unknowingly laid the foundation of computer era.
- They discovered an earliest form of a bead-and-wire counting machine, which subsequently came to be known as abacus. The Chinese improved upon the abacus so that they could calculate and count faster.

NAPIER'S 'LOGS' AND 'BONES'

- John Napier (1550-1617) developed the idea of logarithm. He used logs to transform multiplication problem to addition problem. Napier's logs and bones later became basis for a well known invention known –the computing machine known as “slide rule” (invented in 1662). Napier also advised a set of numbering rods known as Napier's bones. He could perform both multiplication and division with these ‘bones’.

PASCAL'S ADDING MACHINE

- The idea of logarithm, developed in 1614, notably reduced the tedium of repetitive calculations.
- Blasé Pascal, a French mathematician, invented a machine in 1642 made up of gears which was used for adding numbers quickly. This machine was known as adding machine (also known as Pascaline) and was capable of addition and subtraction.

PASCALINE

- It worked on clock work mechanism principle. The adding machine consisted of numbered toothed wheels having unique position values. The rotation of wheels controlled the addition and subtraction operations. The machine was capable of carry-transfer automatically.

LEIBNITZ'S CALCULATOR

- Gottfried Leibnitz, a german mathematician, improved an adding machine and constructed a new machine in 1617 that was capable to perform multiplication and division as well. This machine performed multiplication through repeated addition of numbers. Leibnitz's machine used stepped cylinder each with nine teeth of varying lengths instead of wheels as was used by Pascal.

JACQUARD'S LOOM

- Joseph jacquard manufactured punched cards at the end of American revolution and used them to control looms in 1801. Thus the entire control of weaving process was automatic. The entire operation was under control of a program . with the historic invention of punched cards, the era of storing and retrieving information started that greatly influenced the later inventions and advancements.

BABBAGE'S DIFFERENCE ENGINE

- Charles Babbage, a professor of mathematics, developed a machine called DIFFERENCE ENGINE in the year 1822. This machine was expected to calculate logarithmic tables to a high degree of precision. The difference engine was to calculate various mathematical functions. The machine was capable of polynomial valuation by finite difference and its operation was automatic Multi-stop operation.

BABBAGE'S ANALYTICAL ENGINE

- In 1833, Charles Babbage started designing an analytical engine which was to become real ancestor of modern day computer. With the methodical design of his analytical engine, babbage meticulously established the basic principles on which today's computers work.

CONTINUES...

BABBAGE'S ANALYTICAL ENGINE

- The first innovation enabled the machine to compare quantities and then decide which of the instruction sequences to follow. The second permitted the results of a calculation to change numbers and instructions already stored in the machine.
- His great inventions of difference engine and analytical engine earned Charles Babbage the title “FATHER OF MODERN COMPUTERS”.

MARK-1

- Prof. Howard Aiken (1900-1973) in USA constructed in 1943 an electromechanical computer called mark-1 which could multiply two ten digit numbers in 5 seconds- a record back then. MARK-1 was the first computer which could perform automatically without any manual intervention according to preprogrammed codes.

THE GENERATIONS OF MODERN COMPUTERS

- The term 'computer generation' is often used in connection with computer hardware.
- These are in fact phases of development characterized by type of switching circuit it utilizes.

STORED PROGRAM COMPUTER

- Most computers today use the idea of 'stored program computer' proposed by *Dr. John von Neumann* in 1945.
- The 3 key concepts of the architecture are:-
 1. *Data and programs are stored in a single read-write memory.*
 2. *The memory contents are addressable by locations.*
 3. *Execution takes place in a sequential fashion i.e. from one instruction to the next unless modified explicitly.*

THE 1ST GENERATION COMPUTERS

- The first generation computers used vacuum tubes (thermionic valves) and machine language.
- It used the concept of “stored program concept”.
- The computers were large and programming was a lot more complex than what it is today.

ENIAC

1. ENIAC.

- This was first computer developed in 1946 by a team led by Prof. Eckert & Mauchly at the university of Pennsylvania.
- Expanding, it yields ELECTRONIC NUMERICAL INTEGRATOR AND CALCULATOR.
- The giant machine measured 30x50 long, weighed 30 tons, contained 18000 vacuum tubes, 70,000 resistors ,10,000 capacitors, 6000 switches, used 150,000 watts of electricity, and cost \$400,000.
- When it was built it was 5000 faster its closest competitor, the Harserd MARK-1.

EDVAC

- ELECTRONIC DISCRETE VARIABLE AUTOMATIC COMPUTER (EDVAC).
- Was completed in 1950.
- The stored program concept was applied here which made it faster since program and data both were locally available to the computer.

EDSAC

- ELECTRONIC DELAY STORAGE AUTOMATIC COMPUTER (EDSAC) was built by prop. M.V.Wilkes at Cambridge university in 1949.
- Used mercury delayed lines for storage .
- It used 'stored program concept'.

UNIVAC-I

- Commercial production of stored program electronic computers began in 50's.
- One such computer was Univac-I delivered by Univac division of Remington Rand and in 1951.

OVERVIEW OF THE FIRST GEN

- Although the computers of this generation were welcomed by Govts. And universities but it suffered from some big limitations like:- slow operating speed, bulky size and mass, high power consumption, short mean time between time between failures, limited programming capabilities.
- Further researches in this field were to remove these limitations.

THE SECOND GENERATION COMPUTERS

Some key features of this generation computer are:-

- ✓ Transistor replaced vacuum tube
- ✓ Computers became smaller
- ✓ Generated less heat
- ✓ Electricity consumption lower
- ✓ More reliable
- ✓ Faster
- ✓ Core memory developed
- ✓ Magnetic tapes and disks used
- ✓ First operating system developed.
- ✓ Programming in machine as well as assembly languages

THE THIRD GENERATION COMPUTERS(1966-75)

some key features of this generation
computers are:-

- ✓ Integrated circuits developed
- ✓ Power consumption lowered
- ✓ Computers smaller, faster and more reliable
- ✓ High-level languages appeared

THE FOURTH GENERATION COMPUTERS(1976-PRESENT)

Some key features of fourth generation computers are:-

- ✓ Integrated circuits smaller & faster
- ✓ Micro computer series such as IBM & APPLE developed
- ✓ Portable computers developed
- ✓ Great development in data communication
- ✓ Different types of secondary memory with high storage capacity & fast access developed

THE FIFTH GENERATION COMPUTERS (COMING GENERATION)

- ✓ Fifth generation computers based on artificial intelligence are still in development.
- ✓ Some applications such as voice recognition are already being used and improvised.
- ✓ The use of parallel processing and superconductors is making it (AI) happen.
- ✓ It is a lot about fantasy computing right now. It's moving closer to sci-fi.

APPLICATIONS FOR 5th GENERATION COMPUTERS

- ✓ Decision making robots, which can take visual inputs and respond on its own, working without any step by step instructions.
- ✓ Applications examples of fifth generation computers are:-
- ✓ Intelligent systems that could control the route of a missile and Defence-systems that could fend-off attacks.
- ✓ Word-processor that could be controlled by means of speech recognition
- ✓ Programs that could translate documents from one language to another.

THE GOAL

- ✓ The goal of fifth generation computing is to develop devices that responds to natural language input and are capable of learning and self-organization.
- ✓ The most noticeable among the other characteristics will be that of applying the previously gained knowledge.

TYPES OF COMPUTERS

Computers can be classified into three categories:-

1. Digital computers
2. Analog computers
3. Hybrid computers

DIGITAL COMPUTERS

- ✓ The computers working upon binary digits are digital computers.
- ✓ They are accurate and fast.
- ✓ They have become omnipresent recently.

CLASSIFICATION OF DIGITAL COMPUTERS

These can be classified in two ways.

- Purpose-wise
- Size and performance wise

PURPOSE-WISE

On this basis there are two divisions:--

1. Special-purpose computers
2. General purpose computers

SPECIAL PURPOSE COMPUTERS

Those designed to perform a specific task.

- ✓ The instructions are permanently scratched in the system itself.
- ✓ Though they are accurate they aren't versatile.

GENERAL PURPOSE COMPUTERS

These are versatile computers which we generally use. These don't have permanent programs (i.e. in memory) but many applications are available on many mediums like HD. These are called at the time of execution.

SIZE AND PERFORMANCE WISE

- ✓ Embedded computers
- ✓ Micro computers
- ✓ Mini computers
- ✓ Mainframe computers
- ✓ Super computers

ANALOG COMPUTERS

The devices that measure physical quantities such as voltage, length, current, temperature etc. are Analog devices. for ex:-

Voltmeter, ammeter.

Similarly Analog computers operates by measuring rather than counting.

DIS/ADVANTAGES OF ANALOGS

- ✓ The main advantage---speed (as the calculations are done in a parallel mode.)
- ✓ Poor accuracy is the main disadvantage (as it measures)

USES

- ✓ Analog computers are mostly used in engineering and scientific applications.
- ✓ An electronic weighing scale is a good example of analog computer.

HYBRID COMPUTERS

- ✓ These utilize the best qualities of both digital and Analog computing.
- ✓ Some calculations take place as in an Analog and others in digital way.

USES

- ✓ These are best used in hospitals where some tasks require measurements (blood pressure, heart-beat) and the following operations are carried upon them in a digital fashion.
- ✓ Also used in weather forecasting.

**THANK
YOU**